



**IASP Special Interest Group (SIG) on the Prevention of Intentional Pesticide Poisoning**

**Bibliography: Americas**

Botella de Maglia, J. and J. E. Belenguer Tarin (2000). "[Paraquat poisoning. A study of 29 cases and evaluation of the effectiveness of the "Caribbean scheme"]." *Med Clin (Barc)* **115**(14): 530-533.

**BACKGROUND:** To study clinical aspects of the oral paraquat intoxication and to assess the effectiveness of both the charcoal haemoperfusion and the so-called "Caribbean scheme" (cyclophosphamide, dexamethasone, furosemide and vitamins B and C) to reduce its mortality. **PATIENTS AND METHOD:** Retrospective study of 29 consecutive cases admitted to our intensive care unit in 17 years. **RESULTS:** a) Twenty five men and four women ingested 20% paraquat solution, either accidentally (4 subjects) or deliberately (25 subjects). The suicidal purpose was particularly strong among men aged 50-66 years. Most of patients had vomits and diarrhoea. All patients developed oral and pharyngeal caustic lesions. Hypokalaemia was detected on admission in 9 patients. Increased levels of serum aminotransferases, bilirubin, amylase or creatinkinase were detected in some patients. Twenty two patients developed acute renal failure and 18 patients respiratory failure. Twenty patients died (ten in the first 48 hours and ten between days 3 and 30); b) charcoal haemoperfusion was performed on 16 patients; 4 of the 16 treated patients survived, versus 5 of the 13 non treated ( $p = \text{NS}$ ), and c) the "Caribbean scheme" was applied on 18 patients. All but one of the 11 subjects who ingested  $\geq 45$  ml (treated with the "Caribbean scheme" or not) died. Among those who ingested 45 ml, 8 of the 12 treated patients survived, versus none of the 6 non treated ones ( $p < 0.05$ ). **CONCLUSIONS:** Charcoal haemoperfusion did not reduce mortality of paraquat. The "Caribbean scheme" was associated with a lesser mortality in the subjects who ingested 45 ml of 20% paraquat solution.

Caldas, E. D., F. M. Rebelo, et al. (2008). "Poisonings with pesticides in the Federal District of Brazil." *Clin Toxicol (Phila)* **46**(10): 1058-1063.

**INTRODUCTION:** Pesticides are the second major cause of poisoning in Brazil, but information about the chemicals involved and the clinical management of patients is scarce. **METHODS:** This study is a retrospective review of 709 pesticide cases reported to a toxicological information center from 2004 to 2007. **RESULTS:** Over 90% of the cases occurred after accidental or self-poisoning; more than 60% of the accidents involved children up to 4 years old, mainly with domestic pyrethroid insecticides. One hundred ninety-four cases involved chumbinho, an illegal rodenticide known to contain acetylcholinesterase inhibitor insecticides, mainly aldicarb. In about half the cases, the individuals were admitted to hospitals. Those poisoned with acetylcholinesterase inhibitors stayed longer and most of them displayed pronounced clinical signs of poisoning (Poisoning Severity Score grades 2-4); 14 of the 18 deaths reported occurred with these products. Atropine was given to about 30% of the individuals, including to some with no cholinergic symptoms or exposed to non-acetylcholinesterase inhibitors. All 81 poisonings with coumarin were asymptomatic, but in half of the cases the individuals received vitamin K. **CONCLUSIONS:** The lack of laboratory support to confirm the chemical involved in the poisonings certainly contributed to the unnecessary antidote administration. In spite of continuing government efforts, poisoning with chumbinho is still a major problem in the country.

Chesneau, P., M. Knibiehly, et al. (2009). "Suicide attempt by ingestion of rotenone-containing plant extracts: one case report in French Guiana." Clin Toxicol (Phila) **47**(8): 830-833.

INTRODUCTION: Several species of plants in the Fabaceae family are traditionally used for poison fishing because they contain ichthyotoxic rotenoids. In French Guiana two species of Fabaceae belonging to Lonchocarpus genus with a toxic rotenone effect are used for such ancestral practices. Rotenone is of low toxicity for humans when it is diluted, but its neurotoxicity at higher concentrations is well known to users. CASE REPORT: The purpose of this article is to describe a case of self-poisoning by an 86-year-old woman who ingested a bowl of mashed ichthyotoxic plants. Despite early onset of severe symptoms, the patient regained consciousness and resumed normal breathing within a few hours with only symptomatic treatment. CONCLUSION: The clinical pattern observed in this patient (onset of digestive manifestations followed quickly by loss of conscience and respiratory insufficiency) is in agreement with the few poisonings reported in the literature involving other Fabaceae species containing rotenoids in Asia or involving concentrated rotenone used in insecticides. In patients, who survive the initial phase, symptoms usually regress quickly.

Cole, D. C., F. Carpio, et al. (2000). "Economic burden of illness from pesticide poisonings in high Ecuador. [Spanish]." Revista Panamericana de Salud Publica Pan American Journal of Public Health **8** (3): 196-201.

Active surveillance of acute pesticide poisonings in a potato-growing region of highland Ecuador during 1991-1992 uncovered a rate of 171/100 000, due predominantly to occupational exposures to organophosphate and carbamate pesticides. Occupational exposure among agricultural workers was the most common reason for poisoning (32 male workers and 1 female worker, out of a total of 50 cases). Of these 33 cases, 28 of them reported pesticide application as the work task just prior to poisoning, with over 80% citing the use of World Health Organization Hazard Category I pesticides. The suicide rate of 17.1/100 000 and the overall mortality rate of 20.5/100 000 that we found are among the highest reported anywhere in the world. At the exchange rates prevailing at that time, median costs associated with these poisonings were estimated as follows: public and social security health care direct costs of US\$ 9.85/case; private health costs of US\$ 8.33/case; and lost-time indirect costs of US\$ 8.33/ agricultural worker. Each one of those costs was over five times the daily agricultural wage, which was then about US\$ 1.50. Further costing of pesticide poisonings should be carried out in other settings to provide appropriate information for decisions about pesticide use. In addition, integrated pest management should be further evaluated as an appropriate technology to reduce the economic burden of illness from pesticide poisonings in developing countries.

Corriols, M., J. Marin, et al. (2009). "Incidence of acute pesticide poisonings in Nicaragua: a public health concern." Occup Environ Med **66**(3): 205-210.

OBJECTIVES: To estimate the cumulative incidence rate of acute pesticide poisoning in the year 2000 among Nicaraguan subjects over 15 years of age.

**METHODS:** Data on pesticide exposure and health effects were assessed in a nationally representative survey. Based on self-reported cases, we estimated the 1-year incidence rate and the number of expected cases of acute pesticide poisonings in Nicaragua. **RESULTS:** Among the 3169 survey respondents, we identified 72 persons who self-reported one episode of acute pesticide poisoning in 2000. Of these, 65 cases (90%) were related to occupational exposure, five (7%) to domestic exposure and two (3%) to intentional exposure. The cumulative incidence rate/100 individuals of pesticide poisonings in Nicaragua in 2000 was 2.3 (95% CI 1.7 to 2.8). This corresponds to 66 113 cases (95% CI 51 017 to 81 210). The highest rate was found among males in rural areas, particularly among farmers and agricultural workers. **CONCLUSION:** This study demonstrates an extremely high risk of acute pesticide poisoning in Nicaragua. Considering this, comprehensive measures should be implemented to reduce adverse health effects.

Gonzalez-Andrade, F., R. Lopez-Pulles, et al. (2011). "Epidemiological issues regarding suicides in Ecuador: An 8-year report." Journal of Public Health **19** (2): 161-169.

**Aim:** The aim of this study was to analyze the epidemiological issues related to suicide in Ecuadorians. **Subject and methods:** This is an observational, descriptive, and epidemiological study. The data used in this study arise from the National Institute of Statistics and Censuses register. The study analyzed gender, sex, and method used in suicide and undefined cases. **Results:** Every year in Ecuador 801 individuals die by suicide, with a prevalence rate (PR) of 60.55 deaths per million population (pmp). Suicide is the cause of 1.4% of all deaths in Ecuador. By gender, men account for 70.96% (PR=42.49 pmp), while the percentage in women is only 29.04% (PR=17.58 pmp). The male to female ratio is ~2:1; 76.79% of all the cases involved individuals between 15 and 50 years of age. The most common method of suicide is hanging, strangulation, or suffocation (44.35%), followed by unspecified chemicals (20.37%) and pesticide poisoning (20.07%). Every year in Ecuador 352.6 individuals die by unspecified events or undetermined intents. These events could be a source of hidden suicides. By gender, men account for 76.39% (PR=20.35 ppm). The male to female ratio is ~3:1. **Conclusion:** Suicide in Ecuador has increased in a constant and progressive way, even though there is major underreporting of these cases. The main method to commit suicide was hanging followed by pesticide poisoning. Suicide prevalence rates were similar to neighboring countries in South America, with the exception of Uruguay. Unspecified events or undetermined intents could be a source of hidden suicides, a fact that needs further analysis. Springer-Verlag 2010.

Jors, E., M. Christoffersen, et al. (2013). "Suicide attempts and suicides in Bolivia from 2007 to 2012: pesticides are the preferred method - females try but males commit suicide!" Int J Adolesc Med Health: 1-7.

**Abstract Background:** Suicide attempts and suicides constitute a significant burden on communities and health systems, especially in low income countries. However, many low income countries lack epidemiological information on which to base future preventive strategies. This study reports

on gender and age profiles as well as the likely background and means used for suicide attempts and suicides in Bolivia. Method: This study presents 1124 cases from four different sources of information: (i) emergency ward data with suicide attempts by poisoning from the year 2007, (ii) psychiatric ward data including suicide attempts from July 2011 to July 2012, (iii) newspaper articles reporting attempted suicides and suicides from 2009 to 2011, and (iv) the National Statistics on Crime reporting suicides from the years 2010-2011. Data on age was stratified into three age groups: adolescents aged 10-19 years, young adults aged 20-29 years, and older adults aged above 29 years. Data from the hospital wards and Crime Statistics were pooled to compare characteristics of suicide attempts with suicides concerning age and gender. Data on age, gender, methods used, and reasons were analyzed using IBM SPSS version 21. Results: Hospital data showed that more females (403/657, 61%) than males (254/657, 39%) attempted suicide, and females attempted suicide at a younger age than males ( $p < 0.05$ ). In contrast to this, more males (208/293, 70.5%) than females (85/293, 29.5%) committed suicide, and furthermore it was most prevalent among young adults aged 20-29 years of both genders, as observed from the Crime Statistics. The dominant method was pesticide poisoning varying from 400 out of 657 (70.5%) of the hospital poisoning cases to 65 out of 172 (37.8%) of the newspaper cases. Newspaper data showed a higher mortality rate (65/77, 85.1%) among those using violent methods such as hanging and jumping compared to non-violent methods (43/84, 50.9%) such as ingesting chemicals and drugs ( $p < 0.05$ ). The reasons were related to interpersonal problems, economic problems, depression, and unwanted pregnancies. Many cases of suicide seemed to be hidden due to cultural and religious reasons. Conclusion: More females attempted suicide, whereas more males realized suicide. Suicide attempts were most numerous among adolescents in contrast to suicides being most prevalent in the older age groups. Self-poisoning with pesticides was the most popular method used. Access to potential suicide materials should be restricted and psychosocial interventions initiated to prevent suicides.

Keifer, M., R. McConnell, et al. (1996). "Estimating underreported pesticide poisonings in Nicaragua." *American Journal of Industrial Medicine* **30** (2): 195-201.

We undertook to estimate the degree of underreporting to a regional pesticide poisoning registry, and to estimate the true incidence of poisoning in an agricultural region of Nicaragua. We surveyed 633 workers at 25 of 33 agricultural cooperatives and any nearby private farms in a area geographically convenient to the regional health headquarters with a short structured interview about pesticide poisoning. Eighty-three percent of workers described current use of pesticides. Twenty-five percent described a pesticide poisoning in the preceding 12 months, and almost one-half (48%) described having been made ill by pesticides at some point in time. Sixty-nine (11%) described a poisoning in the preceding month, 23 of whom had received medical attention. The names of the medically treated were sought in the Regional Pesticide Poisoning Registry for the survey year of 1988. Only 8 of the 23 subjects were found reported to the registry when a total of 1,143 human pesticide poisonings were reported in the entire region. Using 65% as an estimate of underreporting to the registry, we calculate that

3,300 (95% CI 2100-7500) poisonings had received treatment in the region in 1988, of whom more than 2, 100 remained unreported. Based on the ratio of total poisonings (treated and untreated) to registry-reported poisonings among our survey respondents, we estimate that 6,700 (95% CI 4100-1800) systemic poisonings, occurred in 1988 in the region. Underreporting of pesticide poisonings disguises the enormity of the problem in developing countries. Even in a region with a strong emphasis on illness reporting for targeted conditions, underreporting is substantial. This method for estimating underreporting is easily applied and provides a rough estimate of registry underreporting and actual incidence for conditions identifiable by a community-applied questionnaire.

Kervegant, M., C. Schmitt, et al. (2013). "Self poisonings with paraquat in French Guiana: Persistent use during suicidal behavior in French overseas territories. [French]." *Annales de Toxicologie Analytique* **25 (2)**: 71-73.

Objective: Paraquat is a pesticide widely used around the world as herbicide. The toxicity of this molecule on human beings is high as it induces after ingestion liver and renal failure with possible delayed pulmonary fibrosis. After numerous reports about this major toxicity the European authorities decided to withdraw this herbicide of the market in July 2007. The authors report a collective case of poisoning with paraquat in French Guiana in 2011. Method: A teenager boy and his mother ingested paraquat deliberately. Hepatic and renal failures were observed for the young male who was treated with the immunosuppressive protocol treatment in order to prevent the pulmonary complications. His mother rapidly developed multi-organic failure. Results: The young boy's hepatic and renal failure evolved quickly favorably. No respiratory disturbances were reported with him allowing a discharge after 16 days of hospitalization. His mother who ingested higher quantities of paraquat died in 2 days. Conclusion: This collective case proves that 4 years after the prohibition of paraquat in French Guiana it is still possible to observe life-threatening poisonings induced by such a dangerous herbicide. 2013 Societe Francaise de Toxicologie Analytique.

Mena, C., M. Bettini, et al. (2004). "[Epidemiology of intoxications in Chile: ten years of registry]." *Rev Med Chil* **132(4)**: 493-499.

BACKGROUND: The existence of Poison Centers for management and prevention of intoxications has been endorsed by the international experience. In Chile, the Toxicological Information Center at the Pontifical Catholic University of Chile has been active since 1992, receiving about 130,000 calls until 2002. AIM: To analyze the statistical data gathered throughout the first ten years of our Research Center. To delineate the epidemiological pattern of intoxications in Chile. MATERIAL AND METHODS: Retrospective study in which records from calls for toxicological information received during the 1992-2002 period reviewed. Analyzed data were total calls per year, place of call, exposure circumstances, age, sex, route of exposure and involved agents. RESULTS: 96,468 calls analyzed. The main exposure circumstance was "unintentional" (78.6%), followed by "intentional" (16.9%). Intoxications in children under 5 years old motivated 50% of calls. According to route of exposure, ingestions involved 75,992 calls (78.8%). Medications were the most common substances, accounting for

49.2% of calls, followed by cleaning products (12.1%), pesticides (11.3%), industrial and chemical products (10.5%) and cosmetics (2.7%). Medications acting on the CNS were the most recurrent, with 19,096 reports.

CONCLUSIONS: The epidemiological pattern for intoxications in Chile is very similar to that reported in developed and other Latin American countries. Children under 5 years old, are a high risk group for intoxications. It is imperative to improve the recording and follow-up of patients that call to the Center, to improve epidemiological data of intoxications in Chile.

Neves, P. D. and M. Bellini (2013). "[Intoxication due to pesticides in the central northern region of the State of Parana, Brazil - 2002 to 2011]." Cien Saude Colet **18**(11): 3147-3156.

This research is based on epidemiological records of toxicological occurrences in individual records of investigation into pesticide poisoning at the Maringa Intoxication Control Center at the Regional University Hospital of Maringa. The intoxications in patients poisoned from 2002 to 2011, in towns that comprise the Central Northern Parana Geographic Mesoregion where Maringa is located, were taken into consideration in this study. As a result, it was established that approximately 67.12% of those poisoned were males, the age groups most affected are 20-29 years old and 30-39 years old. Suicide attempts appear as the main motivation for hospitalization (possibly disguising the chronic intoxication), and mainly insecticides and herbicides are involved in the poisonings, with 62.60% and 26%, respectively. Lastly, the urgent need for public health policies in to reduce this statistic immediately is self-evident, as these poisonings are the ones recorded, as those resulting from food poisoning are not being computed.

Pedroso, J. A. and C. A. Silva (2010). "The nephrologist as a consultant for acute poisoning: epidemiology of severe poisonings in the State of Rio Grande do Sul and techniques to enhance renal elimination." J Bras Nefrol **32**(4): 340-348.

Accidental and intentional poisonings or drug overdoses constitute a significant cause of aggregate morbidity and mortality, and health care expenditures. The nephrologist is frequently called to the emergency room and ICU as a consultant to help with the indication of measures to enhance renal deuration of toxic agents. This study reviews the use of dialysis in acute poisonings due to medications or pesticides, whose specialized toxicological support was provided via telephone by the poison control center of the state of Rio Grande do Sul (CIT-RS from Portuguese). The correlation between need for dialysis and death was assessed in a retrospective cohort (1998-2000). Of the 36,055 cases registered, 337 were identified as severe, and 245 met the inclusion criteria required. Mean age was 30 +/- 18 years, and 53% of the patients were women. The most commonly involved medications were anticonvulsants and antidepressants, and the pesticides were organophosphates, bipyridyl compounds, and glyphosate. Techniques to enhance elimination included urinary alkalization (n = 37) and dialysis. In severe poisonings, dialysis was performed in 4.5% of the cases (n = 11), 3.67 procedures/year (1/22.7 reports of severe cases). In the group undergoing dialysis, 91% involved a suicide attempt (mainly phenobarbital and paraquat). Two cases required hemoperfusion (chloramphenicol and paraquat). Death among non-dialyzed severely ill patients occurred in 25.6%,

versus 36.3% of dialyzed patients (RR = 0.89; 95% CI = 0.54-1.35). The findings can be explained by the statistic power associated with the number of procedures performed. The nephrologist should be aware of situations requiring the use of dialysis, even if not necessarily aimed at renal replacement, but at enhancing depuration of a toxic agent.

Pires, D. X., E. D. Caldas, et al. (2005). "[Pesticide use and suicide in the State of Mato Grosso do Sul, Brazil]." *Cad Saude Publica* **21**(2): 598-605.

Prevalence of suicide with pesticides in the State of Mato Grosso do Sul, Brazil, was evaluated based on data from the Integrated State Center for Toxicological Surveillance under the State Health Department and reported from January 1992 to December 2002. Population and crop production data were collected from the Brazilian Institute of Geography and Statistics, and suicide data were obtained from the State Health Department. During the period studied, 1,355 cases of pesticide poisoning were reported, including 506 suicide attempts, resulting in 139 deaths. The regions of Campo Grande and Dourados had the highest prevalence of suicide attempts, with Dourados having the most deaths. Dourados also had a high prevalence of suicide attempts overall, with an increasing trend in the previous 10 years. The results indicated that Dourados is a critical region in the State in terms of intentional ingestion of pesticides, showing the need for an epidemiological investigation to better evaluate and quantify these events among the rural population.

Rapeli, C. B. and N. J. Botega (2005). "Clinical profiles of serious suicide attempters consecutively admitted to a university-based hospital: a cluster analysis study." *Rev Bras Psiquiatr* **27**(4): 285-289.

**OBJECTIVE:** To verify the presence of different groups of medically serious suicide attempters who had more clinical or surgical seriousness and required admission to a general hospital. **METHODS:** 121 patients admitted consecutively were assessed. A questionnaire containing items on the patient characteristics and psychometric scales to assess the suicidal intent and lethality were used. A cluster analysis was performed using the K-means method. **RESULTS:** Three groups were identified: 1) 43 subjects (mostly female) characterized by self-poisoning with medication and low suicidal intent, with highly impulsive suicide attempts; 2) 53 subjects (mostly males) who ingested pesticides and presented both moderate degrees of lethality and suicidal intent; 3) 17 subjects (predominantly males) who used more violent methods and presented high levels of lethality and suicidal intent. **CONCLUSIONS:** Grouped data of these inpatients could be misleading for follow-up research purposes as our findings indicate that there are relatively distinct clinical profiles among suicide attempters admitted to a general hospital.

Recena, M. C., D. X. Pires, et al. (2006). "Acute poisoning with pesticides in the state of Mato Grosso do Sul, Brazil." *Sci Total Environ* **357**(1-3): 88-95.

Exposure to pesticides has been the source of many acute and chronic health problems in the rural population, mainly in developing countries. The objective of this study was to characterize the poisonings from acute exposure to agricultural pesticides used in the state of Mato Grosso do Sul,



Brazil, from 1992 to 2002, which were reported to the Integrated Center of Toxicological Vigilance of the State Health Department. A total of 1355 involuntary (accidental or occupational) and voluntary (intentional self-poisoning) cases were reported during the period of the study. The majority of the poisonings occurred with men ranging in age from 15 to 49 years of age (55.1%). One hundred seventy-six poisonings lead to death, with a case fatality rate (CFR) three times higher than the average Brazilian CFR. The pesticide poisoning rates, per 100,000 inhabitants living in rural areas, ranged from 25 to 65.7 during the period of the study. In 2000, the micro-region of Campo Grande, where the state capital is located, had the highest rate, with 100.5 exposure/100,000 inhabitants, followed by Dourados, the larger agricultural region of the state. Insecticides were involved in 75.7% of the poisoning cases, followed by herbicides, with 12.2% of the cases. The anticholinesterase insecticides methamidophos, carbofuran and monochrotophos were the primary pesticides involved in the poisonings. The insecticide dimethoate was associated with the highest CFR (30.8%). The high rates of pesticide poisoning in the rural populations of certain regions of the state of Mato Grosso do Sul indicate the need for a more detailed study concerning the risk of pesticide poisoning among these populations.

van Spijker, B. A., T. Graafsma, et al. (2009). "Impulsive but fatal self-poisoning with pesticides among South Asians in Nickerie, Suriname." *Crisis* **30**(2): 102-105.

BACKGROUND: Intentional self-poisoning with pesticides is a serious problem in many developing countries. It is a commonly used method among South Asians all over the world. AIMS: To describe the circumstances and characteristics of suicides in Nickerie, e, in order to gain insight into why South Asians commonly use self-poisoning. METHODS: An exploratory psychological autopsy study was conducted among 19 survivors of 13 suicides in the Nickerie district in Suriname. RESULTS: Impulsivity plays an important role in self-poisonings, as well as aggression and easy accessibility of pesticides. CONCLUSIONS: Possible answers to the question why South Asians often use self-poisoning as a method for suicide may be found in culture, upbringing, styles of communication and genetics. However, more research is needed to further explore these hypotheses.

Veras, J. L. and C. R. Katz (2011). "Suicide attempts by exogenous intoxication among female adolescents treated at a reference hospital in the City of Recife-PE, Brazil." *Rev Bras Enferm* **64**(5): 833-838.

This study aimed to assess cases of self-inflicted poisoning among adolescents reported by the Toxicological Care Center of a reference hospital in Recife-PE, Brazil. The data were collected between March and May 2010 from hospital charts and structured interviews with the participants and parents/guardians. Among the 25 cases of attempted suicide registered in the period, 21 were female adolescents, who made up the sample of the present study. The adolescents were between 13 and 19 years of age. Pesticides were the most frequent toxic agent used (61.9%). The results of the present study underscore the importance of studying suicide in this population, with a focus on family relations, in order to lay the foundation for the development of prevention and treatment programs for this vulnerable group.